Action Plan

to Promote

the Development and Use of E85

as an Alternative Transportation Fuel

June 2, 1998

Table of Contents

Tables

MISSION – PURPOSE

The E85 Strategic Action Plan is intended to be a document to guide the infrastructure development, marketing and public awareness efforts of E85 advocates nationally. The purpose of the plan is to effectively and efficiently increase the sale and use of 85% ethanol (E85) as an alternative fuel.

This strategic plan is intended to generate additional discussion and insight among the many stakeholders with an interest in this area.

Stakeholders that have participated in the development of this document include:

Governors' Ethanol Coalition
National Corn Growers Association
Ford Motor Company
U.S. Department of Energy
Chrysler Corporation
General Motors Corporation

Summary of Preliminary Action Items

1. *The ethanol industry and E85 fuel providers must change/improve and adopt this action plan and demonstrate commitment to carry forward with implementation. The proposed plan should be shared with a wide variety of stakeholders with an interest in ethanol as a transportation fuel.*

2. *The Department of Energy should be asked to serve as a facilitator, helping bring stakeholders together, especially through the Clean Cities program. Furthermore, the Department should be encouraged to provide funds for analytical work, workshops, public education, and market development activities.*

3. *The industry should identify and prioritize the metropolitan areas that will be the focus of the first year's efforts, and designate industry members or contractors who can implement. The industry should identify/accept success factors that are significant yet achievable.*

4. *Federal and state fleet operators in or adjacent to areas where fuel ethanol is available, should continue to be priority target audiences because they are "covered" by the Energy Policy Act requirements and should be very interested in E85 FFVs. However, as the number of FFVs available in the next several years dwarfs the demands of covered fleets, additional non-covered markets should be addressed.*

MOTIVATION

Recent announcements by the major auto manufacturers revealed plans for large-scale production of ethanol flexible-fuel vehicles. As a result of these production plans our nation faces a truly unique opportunity to demonstrate the viability of alternative fuel vehicles by earning a greater share of the transportation market.

To take advantage of this opportunity, supporters of increased ethanol use are working cooperatively to develop objectives and plans to significantly expand the availability of ethanol fueling stations and persuade motorists to fuel with ethanol.

SITUATION ANALYSIS

Ethanol as an oxygenate -- The use of ethanol as an oxygenate in fuel has grown tremendously over the last 15 years. Ethanol blending in all types of gasoline for light-duty vehicles accounts for about 1.2 - 1.3 billion gallons of ethanol annually (1996 sales of fuel ethanol).

Changes in gasoline formulation, especially the development of mandates for the use of reformulated gasoline (RFG), have changed the dynamics of ethanol blended with gasoline. Ethanol can now be blended into RFG in two ways. Under certain conditions it can be blended directly with gasoline, or it can be added to gasoline in its converted form, Ethyl Tertiary Butyl Ether (ETBE). Current use of ethanol in RFG amounts to the use of 300-400 million gallons of ethanol annually. ETBE production uses less than 10,000 gallons of ethanol per year.

High-blend ethanol -- Ethanol used as a neat fuel (nearly 100% ethanol) has been growing since 1991 when General Motors and Ford introduced flexible-fuel vehicles (FFV) in demonstration projects. These FFVs could burn up to 85% denatured ethanol and 15% gasoline or other approved hydrocarbons/aliphatic ethers -- dubbed E85. E85 is a designated alternative fuel under the Energy Policy Act of 1992.

In recent years, the number and types of E85 FFVs increased significantly and by 1997 there were more than 10,000 E85 vehicles on the road. The situation has changed dramatically, however, in June 1997 when both Ford and Chrysler announced plans to manufacture massive numbers of flexible-fuel vehicles. Chrysler plans to manufacture about 200,000 E85 mini-vans in model year 1998

for introduction nationwide.[1] All 3.3 liter Chrysler mini-vans will come with E85 capability standard at no additional cost. Ford announced plans to manufacture all model year 1999 Ford Ranger pickup trucks with E85 capability standard, plus several other models of vehicles that will total about 250,000 over the next three years. Based on currently announced production plans, by the year 2000 there will be more than a half a million E85 flexible-fuel vehicles traveling the nations highways.

Greenhouse gas benefits -- The announcement of large-scale introduction of E85 vehicles highlights the tremendous potential for ethanol as a transportation fuel. Simultaneously, the search for fuels and vehicle technologies to help reduce greenhouse gas emissions from transportation has identified ethanol as a strong candidate for a low-carbon, renewable fuel.

Biomass to ethanol -- Research funded by the U.S. Department of Energy shows tremendous potential to produce renewable ethanol from cellulosic biomass at competitive cost. These new ethanol feedstocks and technologies could complement and supplement existing ethanol production to meet potential future demand for ethanol as a motor fuel.

E85 fueling stations -- The number of existing E85 fueling stations is inadequate to serve this tremendous increase in the number of E85 vehicles. As of June 1998, there were 39 public E85 fueling stations and 32 private stations, spread out over 16 states, primarily in the Midwest. The amount of E85 used in these stations is estimated to be about 1 million gallons annually. There are no ethanol stations in most major metropolitan areas, and none in the Northeast and Southern States, and only one in California.

TABLE 1:
ESTIMATES OF VOLUMETRIC ETHANOL USE - 1997

Ethanol Blend	Ethanol Use (million gallons/year)	Number of Fueling Stations
E10	900	15,000-20,000
Ethanol in RFG	300-400	5,000-10,000
E85	~1	71

[1] Excluding CA, NY, MA & CT

If all the planned production of Chrysler mini-vans for model year 1998 were able to use E85 100% of the time, the demand for E85 would increase by about 150 million gallons per year. If this were the case, by the year 2002 demand for ethanol could increase from 1.2 to 1.3 billion gallons annually to 2.25 billion gallons or more.[2]

Will they use E85? -- Many energy and environmental stakeholders have expressed concern that without a corresponding increase in the availability of ethanol fueling stations most of the new E85 FFVs will be running on gasoline. They would find this unsatisfactory because FFVs were designed to operate on 85% ethanol so that the benefits of using a clean, renewable, domestic energy source could be realized. Using gasoline in these vehicles defeats the purpose.

Automaker motivation -- It is doubtful that automakers would continue to engineer and manufacture vehicles with E85 capability over the long-term unless a significant fraction were in fact using E85. Furthermore, the CAFE credit currently received by automakers for the introduction of FFVs, will come under increasing criticism if the vehicles consume only gasoline. Critics of the CAFE credit have noted that automakers can use the CAFE credit for FFVs to support continued production of lower fuel economy vehicles in the fleet, actually increasing fuel consumption throughout the fleet. Although the total magnitude of any increases in fuel consumption is likely to be small, those concerned with decreasing U.S. reliance on imported oil and decreasing emissions of greenhouse gases have identified a legitimate issue. Indeed, the whole concept of flexible-fuel vehicles that can run on gasoline or alternative fuels will be called into question if the E85 FFVs do not use a significant volume of E85.

Economics, price vs. value -- Another concern is that the economics of ethanol will make it unattractive for E85 users. Current pump prices for E85 in the Midwest are about $1.28 per gallon. Assuming drivers need about 1.3 gallons of E85 to drive the same miles as a gasoline vehicle, the users equivalent cost will be about $1.66 per gallon.[3] Long-term DOE funded research could bring the cost of ethanol down significantly, using biomass feedstocks, but that would not help in the short term. Additional work needs to be done to lower user costs or demonstrate the added value of using E85 fuels.

In short, the opportunity presented by large numbers of E85 vehicles is also a

---

[2] Assumes 2 million FFVs using E85 100% of the time and includ es all ethanol fuel blends such as E10 and RFG.

[3] Some FFV configurations may be able to take advantage of E85's combustion characteristics resulting in those vehicles needing just 1.2 gallons of E85 per gallon, lowering the equivalent cost of E85 to $1.54 per gallon.

challenge. Ethanol supporters must carefully balance and integrate the immediate demands for a major increase in the use of E85 (i.e., in the next two to three years) and the longer term requirements to lay a foundation for the expanded use of ethanol blends and vehicles that can operate on high blends of ethanol in the transportation sector far into the future.

OBJECTIVES

1. Increase the awareness of E85 as an alternative fuel among the general public and owners/operators of E85 vehicles.

2. Increase the sale of ethanol in selected cities/MSAs to a "successful level" .

3. Increase the number of E85 fueling stations in selected cities/MSAs to provide reasonably convenient access for the FFVs in the area.

4. Increase the sale of E85 vehicles in selected cities/MSAs

STRATEGIES

1. **Place infrastructure in locations with predictable demand for E85**

   To achieve sufficient throughput of E85 at a given E85 station, fuel retailers need to be certain that the station is located conveniently near sufficient FFV vehicles, and that the vehicles will be using the E85 fuel.

   - Locations that house federal and state government fleets
   - U.S. DOE Clean Cities - Fleets within Clean Cities can be readily identified and given the competitive cost of the E85 vehicles in comparison with other forms of light-duty AFVs; these are the fleets which we may wish to concentrate on in the near term.
   - Locations that house private fleets

2. **Place infrastructure in areas where fuel ethanol is currently available**

   - Traditional mid-western locations where ethanol is produced and readily available
   - Non-traditional markets outside the mid-west. While most of the production of fuel ethanol takes place in the mid-west, ethanol is a national commodity. Large amounts of ethanol are currently being used in "non-traditional markets" including:
     - Pacific Northwest states of Oregon and Washington
     - Southwest states of Arizona, Nevada, and New Mexico
     - Lower New England states of Rhode Island, Connecticut, New York, New Jersey, and eastern Pennsylvania

   These non-traditional markets offer existing tankage of fuel ethanol; large

scale federal and state fleet operations; include Clean Cities communities; and, are each experiencing significant air pollution problems associated in part with the use of motor vehicles. Introduction of E85 programs into these areas would differ little from those underway in Denver, St. Louis, Kansas City, etc.

3. **Place infrastructure in areas offering the best economics for E85 sales**
   Some areas have gasoline prices, tax structures, or incentives which improve the economics of E85 relative to gasoline. Placing E85 infrastructure in these areas has a greater chance of producing positive results as opposed to other areas which may be less conducive for E85 sales.

4. **Concentrate infrastructure, vehicles and marketing efforts in two or three selected metropolitan areas; add more each year**
   Selected cities should meet criteria of high-priority, including availability of E85 FFVs and fuel, non-attainment status, availability of incentives, EPACT and Clean Air Act coverage, and other criteria. Successful efforts in the first year could be followed by expansion of the efforts to additional metropolitan areas in subsequent years. Efforts should focus on both fleets and the general public.

5. **Develop partnerships with traditional fuel retailers**
   Fuel retailers will be key as the number of E85 stations grows. In order to create the tremendous growth of E85 sites that is identified it will be impossible to individually determine new E85 locations. E85 providers must make a business case for partnership with existing fuel retailers who have the property, location, and facilities. In some areas, given the proper incentive, E85 supply could be introduced at minimal cost to existing stations that already have proper tankage. If possible, metro-wide retailers should be sought as partners to allow true synergy between the E85 provider and retailers interests. Working in partnership with traditional fuel retailers, develop a forum for addressing fuel specification and quality issues.

6. **Undertake public outreach and education efforts**

   - **Value issue – E85 a performance fuel**

   In order to compete for and win customer loyalty, E85 vehicles and fuel must deliver value. To achieve widespread E85 use, the fuel must be reasonably competitive (on a miles traveled basis) with gasoline. The message of the value of a gallon of E85 (i.e., high octane resulting in increased performance and efficiency, "home grown" fuel, air quality and

global warming impacts) should be "broadcast" to fleets and the public. However, E85 promotion will be a tough sell. In order to do so in the near-term, E85 supporters will need to lower costs or properly articulate the performance value of E85 to the consumer.

- **Clean Air/Global warming benefits**

The E85 program should capitalize on a growing interest in greenhouse gases, urban air pollution, and alternative fuels and aim messages on these benefits to all of the target audiences.

- **Made in America - E85 vs. Imported Oil**

The E85 program should capitalize on national pride and the value of additional domestic jobs in agriculture and ethanol production resulting from the use of E85 as opposed to using imported oil.

7. **Identify target audiences. Develop appropriate messages and methods to influence their use of E85.**

- **Federal, state and local units of government fleets**
  - Government fleets, properly identified and given the proper incentives, can provide predictable fuel demand for E85 refueling stations. In many metropolitan areas, however, the number of government fleets that will purchase FFVs in the first two years is small and may not be conveniently located.
  - Government fleet vehicles represent only a small portion of the registered automobiles in the U.S. and a small portion of the fuel used in the U.S.

- **Private Fleets**
  - Image and environmentally conscious private companies
  - Agribusiness organizations
  - Fleet leasing companies, rental car companies

- **Private Fleets**
  - Members of environmental organizations
  - Members of health related organizations
  - Members of agricultural organizations
  - Members of other special interest groups
  - Other "un-interested" parties
  - the bulk of the future sales of E85 FFVs will be non-fleet vehicles

8. **Develop a plan for infrastructure development in areas where efforts are underway to establish biomass to ethanol production facilities.**

   Several projects are currently underway to develop biomass to ethanol conversion facilities throughout the U.S. While the current production and use of ethanol is concentrated in the mid-west, plans should be implemented to develop E85 infrastructure and to increase public awareness in these other areas. These projects have the potential to generate a significant amount of positive press creating an opportunity for successful introduction of infrastructure and use of that infrastructure.

SUCCESS MEASURES

All of the objectives outlined in this document should be and are interrelated. Some of the measures of success are overlapping in their area of objective. For instance – it is our plan to have reached, at a particular time a goal of awareness that is listed below on the awareness continuum. On that same continuum when 20 percent of the general public are aware of E85, we expect .5 percent of them to be buying E85 fuel.

TABLE 2
E85 AWARENESS CONTINUUM

% General Public	20%	10%	1%	.5%
	AWARE	INFORMED	TRIAL	REGULAR USE
% E85 Owners / Operators	90%	90%	75%	25%

For each major metropolitan area that is targeted for E85 investment, the refueling stations must be built to serve the number of vehicles that will be located in the area and can demand a volume of fuel sufficient to keep the stations profitable. Potential retailers of E85 must have sufficient volume and incentive to justify offering the E85 fuel. This means both recapture of investment and gross profits that meet or exceed any product that could have been offered in place of E85.

One success measure will be the increased use of E85 within a selected city or MSA. Table 3 illustrates success measures for a "Typical" MSA or city with a population of 2.4 million after 5 years of participating in the program. However, the number of FFVs using E85 and the volume of E85 demand for each level of success will vary according to the population of the MSA or city and the size of the included light-duty fleets within that area. An MSA or city with a population of 250 thousand should not be expected to produce the same volume of E85 demand as an MSA or city with a population of 5 million and a large fleet of Governmental light-duty vehicles.

TABLE 3
SUCCESS MEASURES FOR INCREASED E85 USE IN A TYPICAL MSA[1]
(5 YEARS AFTER ENTERING PROGRAM)

Objective	Number of FFVs Using E85	Percent of Fill-ups Using E85	Annual Volume of E85 Demanded (E85 gals)
Long-Term Vision	**13,500**	**75%**	**6,075,000**
Highly Successful	**6,750**	**75%**	**3,038,000**
Successful	**4,500**	**50%**	**1,350,000**
Moderate Success	**2,250**	**25%**	**338,000**

Notes:
[1] Based on an MSA with a population of about 2.4 million and about 1.8 million passenger vehicles; annual new FFV acquisitions of about 4,500 (about 3% of total new LDV purchases). Moderate Success relates to 10% of FFV acquisitions using E85; Successful relates to 20% of FFV acquisitions using E85; Highly Successful relates to 30% of FFV acquisitions using E85; and Long-Term Vision relates to 60% of FFV acquisitions using E85 fuel.

Another measure of success for a typical MSA or city will be the development of E85 refueling infrastructure. This should be interfaced with the increased E85 usage within that MSA or city. Table 4 shows how the number of E85 refueling stations and fuel sales at those stations should grow (after 5 years) with the level of success that is achieved within that MSA or city. Again the number of stations and volume of sales associated with each level of success will vary according to the population and fleet concentrations within that MSA or city.

TABLE 4
SUCCESS MEASURES FOR INCREASED E85 INFRASTRUCTURE DEVELOPMENT AND USE IN A TYPICAL MSA[1]
(5 YEARS AFTER ENTERING PROGRAM)

Objective	Number of New Service Stations Offering E85	Annual Volume of E85 Sold / Station (E85 gals)
Long-Term Vision	50	121,500
Highly Successful	25	121,500
Successful	15	90,000
Moderately Successful	5	67,600

Notes:
[1] Based on an MSA with a population of about 2.4 million and about 1.8 million passenger vehicles; annual new FFV acquisitions of about 4,500 (about 3% of total new LDV purchases).

As the number of MSAs/cities included in the program increase, the success measures for the program will vary with the number, size, and length of time that the MSAs/cities have been included in the program.

Table 5 illustrates possible success measures for increased use of E85 resulting from the program after 5 years, assuming that there are 20 "typical" MSAs/cities included in the program at that time. Table 6 shows how the refueling infrastructure could be expected to grow with the increasing use of E85, according to the success level of the program. If the number or size of the MSAs/cities included in the program were to vary the values associated with each success level would vary accordingly. Table 5 and 6 represent possibilities that would require increased resource commitments from both public and private partners.

TABLE 5
SUCCESS MEASURES FOR INCREASED E85 USE RESULTING FROM E85 ACTION PLAN
(5 YEARS AFTER INITIATING PROGRAM)[1]

Objective	Number of FFVs Using E85	Percent of Fill-ups Using E85	Annual Volume of E85 Demanded (E85 gals)
Long-Term Vision	135,000	75%	60,800,000
Highly Successful	67,500	75%	30,400,000
Successful	45,000	50%	13,500,000
Moderate Success	22,500	25%	3,400,000

Notes:

1. Assumes that there are 20 MSAs included in the program after 5 years. After 5 years, each MSA is expected to be at a different level of development, depending on the date of their entering the program. However, later programs will benefit from a larger existing FFV population, increasing the number of FFVs than can be encouraged to use E85 during any year of the program for that MSA.

TABLE 6
SUCCESS MEASURES FOR INCREASED E85 INFRASTRUCTURE DEVELOPMENT AND USE RESULTING FROM E85 ACTION PLAN
(5 YEARS AFTER INITIATING PROGRAM)[1]

Objective	Number of New Service Stations Offering E85	Annual Volume of E85 Sold / Station (E85 gals)
Long-term Vision	500	120,000
Highly Successful	250	120,000
Successful	150	90,000
Moderately Successful	50	68,000

Notes:

1. Assumes that there are 20 MSAs included in the program after 5 years. After 5 years, each MSA is expected to be at a different level of development, depending on the date of their entering the program.

BUDGET

Private industry must provide a minimum of 75% of the infrastructure costs

The National Ethanol Vehicle Coalition (NEVC), Governors' Ethanol Coalition, National Corn Growers Association, state corn checkoff programs, and, federal and state governments have all been supporting the E85 infrastructure development program. Long term success, however, for the establishment of E85 fueling must be the responsibility of the private sector. The NEVC and its partners are planting the seed, that is, financial assistance to support a limited number of stations. Continued growth in the program must be achieved and will be achieved when the private sector recognizes the profit potential associated with the sale of E85. Describing such profit potential, and more importantly pointing out where it is occurring, must be a major goal of the E85 program.